

<p align="center"><b>LLNL Environmental Restoration Division Standard Operating Procedure</b></p>	<p align="center"><b>TITLE: Collection of Field QC Samples</b></p>
<p><b>APPROVAL</b> _____ <b>Date</b> _____</p> <p><b>Environmental Chemistry and Biology Group Leader</b></p>	<p align="center"><b>PREPARERS: V. Dibley, R. Goodrich, and S. Gregory</b></p> <p align="center"><b>REVIEWERS: R. Brown*, T. Carlsen, E. Christofferson*, B. Failor*, C. Garcia*, J. Gardner**, B. Hoppes*, G. Howard, S. Mathews*, P. Ottesen, and B. Ward*</b></p>
<p><b>APPROVAL</b> _____ <b>Date</b> _____</p> <p><b>Division Leader</b></p> <p><b>CONCURRENCE</b> _____ <b>Date</b> _____</p> <p><b>QA Implementation Coordinator</b></p>	<p align="center"><b>PROCEDURE NUMBER: ERD SOP-4.9</b></p> <p align="center"><b>REVISION: 2</b></p> <p align="center"><b>EFFECTIVE DATE: December 1, 1995</b></p> <p align="center"><b>Page 1 of 9</b></p>

\*Operations and Regulatory Affairs Division

\*\*Weiss Associates

## 1.0 PURPOSE

To obtain various types of Quality Control (QC) samples that provide quality control information necessary for interpretation of data.

## 2.0 APPLICABILITY

This procedure is applicable to the collection of QC samples during routine ground water monitoring, environmental investigations and remediation processes.

## 3.0 REFERENCES

- 3.1 U.S. Environmental Protection Agency (1981), *Manual of Groundwater Quality Sampling Procedures*, EPA-600/22-81-160, Washington, D.C.
- 3.2 U.S. Environmental Protection Agency (1982), *Handbook for Sampling and Preservation of Water and Wastewater*, EPA-600/4-82-029, Washington, D.C.
- 3.3 Weston Managers Designers/Consultants (1988), *Field Sampling Procedures Manual*, Prepared for Lawrence Livermore Laboratory.

Procedure No. ERD SOP-4.9	Revision Number 2	Effective Date December 1, 1995	Page 2 of 9
------------------------------	----------------------	------------------------------------	-------------

- 3.4 U.S. EPA (1987), *Data Quality Objectives For Remedial Response Activities*, Office of Emergency Response and Office of Waste Programs Enforcement, Washington, DC, 20460.
- 3.5 Test Methods for Evaluating Solid Waste, SW-846, November 1986, Third Edition.

## **4.0 DEFINITIONS**

### **4.1 Blind Samples**

Blind samples are samples that have their real identifications replaced with fictitious identifications prior to submittal to analytical laboratories.

### **4.2 Collocated Samples**

Collocated samples are independent samples collected in such a manner that they are equally representative of the parameter(s) of interest at a given point in space and time.

### **4.3 Equipment Blank**

A sample of analyte-free media which has been used to rinse the sampling equipment. It is collected after the completion of decontamination and prior to sampling. This blank is useful in documenting adequate decontamination of sampling equipment.

### **4.4 Field Blank**

The field blank is deionized, analyte-free water which is poured into sample containers in the field at a predesignated sample location. This will indicate any contamination from the sampling container and/or the environment in which the primary sample was collected.

### **4.5 Intralaboratory Collocated Samples**

Intralaboratory collocated samples are collocated samples which are collected and sent as a blind sample to the same laboratory for analysis (usually one is sent as a blind sample). Intra-laboratory collocated samples provide intra-laboratory precision information for the entire measurement system including sample acquisition, handling, shipping, storage, preparation, and analysis.

### **4.6 Interlaboratory Collocated Samples**

Interlaboratory collocated samples are collocated samples which are collected and sent to different laboratories for analysis. Interlaboratory collocated samples provide interlaboratory precision information for the entire measurement system including sample acquisition, handling, shipping, storage, preparation, and analysis.

### **4.7 Quality Control Samples**

Samples that are introduced during the different phases of the data collection process to monitor the performance of the system.

Procedure No. ERD SOP-4.9	Revision Number 2	Effective Date December 1, 1995	Page 3 of 9
------------------------------	----------------------	------------------------------------	-------------

#### **4.8 Replicate Samples**

Replicate samples are samples that have been divided into two or more portions at some step in the measurement process. A sample may be replicated in the field or at different points in the analytical process.

#### **4.9 Split Samples**

Split samples are replicate samples divided into two portions, sent to different laboratories, and subjected to the same environmental conditions and steps in the measurement process.

#### **4.10 Temperature Blank**

A temperature blank is a container of water placed in the sample shipping container that the receiving laboratory measures to determine the water temperature, which indicates sample integrity and preservation.

#### **4.11 Trip Blank**

A trip blank consists of deionized (DI), nitrogen-purged or laboratory demonstrated analyte-free water prepared and provided by the contract analytical laboratory (CAL). Trip blanks are placed in the ice chest with the samples, transported to the field during sample collection, and then to the laboratory along with the samples. Trip blanks are not to be opened in the field; otherwise they are to be handled and analyzed for volatile organics in the same way as samples acquired that day. Trip blanks act as an indicator of sample contamination through handling, preservation, and shipping.

### **5.0 RESPONSIBILITIES**

#### **5.1 Data Management Group (DMG)**

The DMG's responsibilities are to decode the blind QC sample identification names on the printed analytical results, and properly identifying the sample type and matrix in electronic storage.

#### **5.2 Division Leader**

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

#### **5.3 Environmental Chemistry and Biology Group Leader (ECBGL)/QC Chemist**

The ECBGL and/or the QC chemist are responsible for determining the type(s) of analyses to be run on the various QC samples and partially responsible for determining the frequency of QC samples (i.e., field and equipment blanks).

Procedure No. ERD SOP-4.9	Revision Number 2	Effective Date December 1, 1995	Page 4 of 9
------------------------------	----------------------	------------------------------------	-------------

#### **5.4 Hydrogeology Group Leader (HGL)/ Drilling Coordinator (DC)**

The HGL and DC are responsible for determining the frequency of drilling QC samples, such as equipment blanks and collocated samples in consultation with the ECBGL and the QC chemist.

#### **5.5 Sampling Coordinator (SC)**

The SC's responsibilities are to generate the QC sample list and distribute the list to key individuals, including the QC Chemist, ECBGL, Study Area Leaders/Task Leaders (SAL/TL), DMG, Operations and Regulatory Affairs Division/Water Guidance and Monitoring Group Analysts (WGMG), and sampling technicians.

### **6.0 PROCEDURE**

#### **6.1 Generation of the Quality Control Sampling List**

- 6.1.1 The SC shall generate the QC sampling list by calculating the number of samples that need to be collected as collocated samples to meet the ERD Data Quality Objective (DQO) of 10% for all ground water sampling. The 10% is divided into 5% interlaboratory and 5% intralaboratory collocated samples. The SC chooses the installations to be used for collocated samples, field blanks, and equipment blanks at random within each geographic area. However, this list may be modified based upon past history, data anomalies, or logistical problems.
- 6.1.2 The SC shall distribute the QC Sampling List to key individuals listed in Section 5.4.
- 6.1.3 The DC shall determine the number and location of QC samples for drilling activities. As a general rule, 10% of all soil samples will be collocated for water as described above.

#### **6.2 Intralaboratory Collocated Samples**

##### **6.2.1 ERD Water Samples**

Five percent of routine samples for ERD are collected as intralaboratory collocated QC samples. For example: samples are collected, one right after the other. One sample is assigned a fictitious well identifier to blind the samples true identity to the laboratory performing the analysis, and the other is labeled with a true well identifier, then both are sent to the same laboratory. The fictitious well identifiers of the QC samples usually end with an "R" or a "K", or represent an unused legitimate name from a sequential series (i.e., W-181). The SC randomly selects the well locations to be sampled as intralaboratory collocated QC samples and assigns a fictitious well identifier to one of the two samples collected. Examples of fictitious well identifiers are: K8-02R, W-4AR, NC7-88R, W-875-13R, W-7R, W-30-1R, K6-20R, W-834-M1R.

Other fictitious well identifiers are generated as needed.

Procedure No. ERD SOP-4.9	Revision Number 2	Effective Date December 1, 1995	Page 5 of 9
------------------------------	----------------------	------------------------------------	-------------

### 6.2.2 WGMG Water Samples

For WGMG samples, one sampling location is randomly selected quarterly by the SC in each monitoring area and assigned the appropriate fictitious name for a total of 6 “blind” intralaboratory collocated QC samples. These samples are sent to the same laboratory as the “unblinded” sample. The following are intralaboratory collocated QC sample fictitious well identifiers and the corresponding monitoring areas.

Intralaboratory collocated fictitious well identifier sample	Monitoring area
K1-11R	Pit 1
K7-11R	Pit 7
W-817-11R	Building 817 wells (HE Process Area)
K1-21R	Pit 2
K2-11R	Elk Ravine (Eastern and Western Firing Area)
NC5-11R	Off-site water-supply wells

### 6.2.3 ERD Soil Samples

Intralaboratory collocated soil samples may be assigned fictitious names as described in 6.2.1, or they may have “DUP” at the end of the real sample identifier. When a collocated soil sample is taken from a different depth than the original sample, the original sample’s depth as well as the collocated samples depth become part of the collocated sample’s ID. For example, 830-23-(26.8F)-26.3FDUP, where 26.8F is the actual depth and 26.3F is the depth of the adjoining sample for which it is collocated.

## 6.3 Interlaboratory Collocated Water and Soil Samples

When samples are designated as intralaboratory collocated samples, they are collected one right after the other. The samples are labeled with the true well identification and sent to different contract laboratories. An on-site laboratory may be used if a certified secondary contract laboratory is not available.

## 6.4 Critical Wells

At Site 300, all water-supply wells (CDF-1, CON-1, Well 18, Well 20, and Gallo-1) are to be sampled as interlaboratory collocated samples in addition to the 5% interlaboratory collocated samples for QC purposes.

## 6.5 Preparation

6.5.1 To meet ERD sampling requirements, 1-liter amber glass containers of analyte-free water used for field blanks and equipment blanks and VOA vials containing analyte-free water used for trip blanks, should be ordered from the CAL. HPLC-grade water used for WGMG field blanks must be ordered from the appropriate manufacturer. Reorder all supplies as necessary.

Procedure No. ERD SOP-4.9	Revision Number 2	Effective Date December 1, 1995	Page 6 of 9
------------------------------	----------------------	------------------------------------	-------------

- 6.5.2 Ensure that clean ice chests are used to refrigerate the samples.
- 6.5.3 Load ice chests with enough ice cubes or bagged blue ice to keep samples at 4°C.
- 6.5.4 Place trip blanks (one VOA vial per sampling event) for the samples collected in air tight plastic bags in an ice chest.

## 6.6 Operation

- 6.6.1 Compare QC list to sample list to identify QC sampling locations for the day. When sampling a well specified as a collocated sample installation, proceed as follows:
  - A. Collect collocated sample for QC purposes immediately after first sample has been collected. The collocated samples are to have the same requested analyses indicated on the CoC.
  - B. If the installation has been chosen for an intralaboratory collocated sample, label the second sample container(s) with the fictitious identification.
  - C. If the installation has been chosen for an interlaboratory collocated sample, label all the containers with the well's true identification and send one set to the primary laboratory and one set to the secondary laboratory.
  - D. Document QC information in appropriate logbook as per SOP 4.2, "Sample Control and Documentation."
- 6.6.2 Trip blanks (One 40 ml VOA per day) remain within the ice chest throughout the day's sampling activities. Each laboratory receiving samples requires a separate trip blank. Trip blanks are only necessary if samples are to be collected and analyzed for VOCs (volatile organic compounds). The trip blank should be preserved to 4° C in the same manner as the samples.
- 6.6.3 Collect field blanks as indicated in the Sampling Plan. Additional field blanks should be taken if there is any reason to suspect air-borne contaminants (i.e., odors, dust, work being performed near by such as painting, fumigating, etc.). If the installation to be sampled has been selected as a location for a field blank:
  - A. For ERD samples, pour the analyte-free water, provided by the CAL, directly into the appropriate sample container for the requested analyses.
  - B. For WGMG samples, field blanks are made from HPLC-grade water. This water is poured directly from the manufacturers container into the appropriate sample container.
  - C. Cap the container carefully to prevent air bubbles. Label the bottle as indicated on the QC Sample list, and place in an ice chest with the samples.
  - D. During quarterly sampling activities, field blanks are poured at least one time per study area.
  - E. At a minimum, field blanks are required if samples are to be collected and analyzed for VOCs. Some projects will require field blanks for all analytes listed in the sampling plan for a sampling location. The sampling plan will specify the analytes the field blanks should be collected and analyzed for.

Procedure No. ERD SOP-4.9	Revision Number 2	Effective Date December 1, 1995	Page 7 of 9
------------------------------	----------------------	------------------------------------	-------------

6.6.4 Equipment blanks, also known as rinsate samples, are used to ensure that nondedicated equipment involved with sample collection has been adequately decontaminated. This includes equipment used for soil and ground water sample collection, as well as pressure transducers used for hydraulic testing.

- A. Bailer equipment blanks are collected at installations where Teflon bailers are used to sample ground water. Typically, Teflon bailers are used in wells that have concentrations of contaminants under 5,000 ppb ( $\mu\text{g/L}$ ). Equipment blanks are preselected by the SC as part of the quarterly QC sample list. They are selected according to contaminant type and concentration. If the installation to be sampled has been selected as a location for an equipment blank:
  1. Decontaminate the equipment as per SOP 4.5.
  2. Pour enough analyte-free water to fill two 40 mL VOA containers into the bailer to rinse it, then decant into VOA containers, cap it taking care not to leave any air bubbles and label the bottle as indicated on the QC Sample list, and place in ice chest with the samples.
  3. Equipment blanks collected from Teflon bailers are normally analyzed for VOCs only, but may be analyzed for additional compounds as determined by the ECBGL or the QC Chemist.
  4. Label the equipment blank collected from the bailer according to the study area, type (BR for bailer rinsate), and well in which the bailer was used for sampling (i.e., PIT6-BR-K6-16).
- B. Portable pump equipment blanks are collected just prior to use at installations which do not have dedicated purging/sampling systems (SOP 2.1, "Presample Purging of Wells"). An equipment blank will be collected from all portable pumps used for ground water purging and sampling after decontamination and just prior to installation into the well.
  1. Decontaminate the equipment as per SOP 4.5, "General Equipment Decontamination."
  2. Place pump into a clean bucket or barrel containing DI water (source must be approved by the ECBGL or QC Chemist), and operate pump as described in SOP 2.1, "Presample Purging of Wells," and the appropriate equipment manuals.
  3. Equipment blanks collected from portable pumps are normally analyzed for VOCs only, but may be analyzed for additional compounds as determined by the ECBGL or the QC Chemist. Collect samples from the pump in the same manner as described in SOP 2.3, "Sampling Monitor wells with Bladder and Electric Submersible Pumps, and SOP 2.6, "Sampling for Volatile Organic Compounds."
  4. Label the equipment blank collected from the portable pumping system according to the study area, type (PR for pump rinsate), and well in which the pump was used for purging and sampling (i.e., GSA-PR-W-25N-25).
- C. Drilling equipment blanks are collected from soil sampling devices (i.e., split spoon samplers and core barrels). Auger flights will be visually inspected once they have been cleaned to verify they are free from soil

Procedure No. ERD SOP-4.9	Revision Number 2	Effective Date December 1, 1995	Page 8 of 9
------------------------------	----------------------	------------------------------------	-------------

particles. The frequency of these equipment blanks depends upon the past and future drilling locations, and the contaminant type and concentration in these locations. The DC and/or HGL shall determine the necessity and frequency during drilling activities. If equipment blanks are deemed necessary, follow steps 1 through 4.

1. Decontaminate the equipment per SOP 4.5.
2. Pour enough analyte-free water (obtained from the analytical laboratory) or water approved by the ECBGL and/or QC Chemist through or over the surface of equipment, and collect rinsate directly into appropriate containers.
3. Equipment blanks collected from sampling equipment are normally analyzed for VOCs only, but may be analyzed for additional compounds as determined by the DC and HGL in consultation with the ECBGL or the QC Chemist. Consult SOP 2.6, "Sampling for Volatile Organic Compounds."
4. Label the equipment blank collected from the drilling apparatus according to the study area, type (DR for drilling rinsate) and name of borehole in which the equipment was used for drilling (i.e., GSA-DR-35A-05).

#### 6.6.5 Other QC Samples

##### A. Drilling Water

Collect a sample of any water used during drilling activities and analyze for VOCs.

##### B. Drilling Mud

Collect drilling mud samples every 10 to 20 ft if high VOCs are expected.

##### C. Temperature Blanks

Temperature blanks are used to accompany all samples that require temperature preservation. They should consist of a 250-mL poly container, or equivalent, filled with water. The receiving analytical laboratory should measure these blanks and notify the SC if the temperature exceeds  $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . The temperature blank should be documented in the comments section on the CoC form.

#### 6.6.6 Document all QC sample information in the appropriate logbook per SOP 4.2.

### 6.7 Post Operation

- 6.7.1 Prior to leaving the sampling location, cross check samples collected with those requested by the SC or the DC.
- 6.7.2 Handle and ship all samples according to SOP 4.4, "Guide to Handling, Packaging, and Shipping of Samples."



Procedure No. ERD SOP-4.9	Revision Number 2	Effective Date December 1, 1995	Page 9 of 9
------------------------------	----------------------	------------------------------------	-------------

## **6.8 Analytical Results**

As printed and/or electronic analytical results are submitted by the laboratory, the DMG decodes the QC fictitious identifications, replacing them with the actual well identifications on the analytical report, as well as properly identifying the sample type and matrix in electronic storage.

## **7.0 QA RECORDS**

- 7.1 Chain-of-Custody Forms
- 7.2 Logbooks
- 7.3 Sampling and Analysis Plans

## **8.0 ATTACHMENTS**

Not applicable.